

Semiannual Progress Report
May 1, 1965 to October 31, 1965
NASA Research Grant NGR-18-001-008

U. Kentucky

Circadian Rhythms In Primates as Influenced by Latitude, Longitude,
Gravity and Confinement

The second six month period of this project was occupied primarily by the construction of equipment needed for the project; by the delivery, checkout, and, where necessary, modification of equipment ordered from manufacturers; and by the development and utilization of surgical and animal care techniques appropriate to this experiment. A very important contribution to the project occurred when it was joined by Dr. David R. Wekstein, Department of Physiology and Biophysics, University of Kentucky. Dr. Wekstein brings to the program a considerable amount of experience in experimental mammalian physiology, and he has not only taken over the major responsibility for the development of surgical procedures used in the project, but has also been quite active in making the required detailed arrangements for transporting the experiment overseas and otherwise assisting in the program's operation.

In June 1965, the principal investigator made a brief visit to the University of Nagoya, at which time he contacted officials of the University and in particular of its Department of Physiology, making arrangements for the laboratory space and facilities required for this experiment and contacting officials of the Japan Monkey Center of Nagoya regarding the problems of bringing our experiment to Japan. The staff of the Nagoya Department of Physiology was extremely cooperative in providing us with the facilities required for this experiment, and following this visit appropriate correspondence between Nagoya and Kentucky ensued concerning the details of these arrangements. In September 1965, Dr. Wekstein was attending Tokyo as a delegate to the International Physiological Congress, and while in Japan spent an additional week in Nagoya making arrangements for the experiment's arrival and handling with Nagoya trucking firm officials and Japanese customs officials. The situation regarding movement of this experiment into and out of Japan have been discussed in a letter to Dr. Belleville dated November 5, 1965.

Arrangements have been made with four scientists prominent in the Space Biology and Circadian Rhythms fields to review the baseline data obtained at Lexington prior to the first of the geographical shift experiments in order to insure that adequate control data has been obtained prior to inducing a phase shift in these rhythms. These reviewers will include

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Dr. Franz Halberg, Department of Pathology, University of Minnesota; Dr. C. Ladd Prosser, Department of Physiology, University of Illinois; Dr. Ross Adey, Department of Anatomy, University of California at Los Angeles; and Dr. James Enright, Department of Zoology, University of California at Los Angeles.

All major items of equipment have been either delivered or constructed at the present time. Two electrical engineering students at the University of Kentucky were hired to assist the project's electronics technician with the required construction during their summer vacation, and this construction phase of the program is now completed. Equipment checkout and modification is now in progress, and it is anticipated that this will also soon be completed.

In parallel with the equipment construction program, surgical procedures appropriate to the experiment were developed and carried out. To date a total of thirteen monkeys have undergone surgery, with the result that we now have six monkeys ready for experimentation, two which are partially prepared, and one which is still to be operated on. Some fairly severe problems with the use of implanted probes developed in our early monkeys, but with appropriate modifications in our surgical techniques these now appear to be well under control. These surgical procedures have been developed primarily under the direction of Dr. Wekstein, with the assistance of our chemical and surgical technicians and the active cooperation of members of the University of Kentucky Department of Surgery.

As the experiment's data collection equipment has been checked out, we have begun the collection of preliminary control data. To date we have collected data on monkey temperatures, electrocardiograms and urinary constituents, and these will soon be extended to include the monkey's respiration gross activity and metabolism. Availability of these raw data have in turn made possible the checkout of the methods used for analyzing the urinary steroids, catecholamines and electrolytes. Finally, the computer programs which have been written for the analysis of the circadian rhythms in these data have been checked out with artificial data and are now being checked on the experimental data as it begins to accumulate.